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A COMPARISON OF THE BASAL METABOLISM OF NORMAL MEN AND WOMEN

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From the earliest attempts to adjust food intake to the energy requirement it has been recognized that the dietetic needs of men as a class are somewhat greater than those of women. This increase has been commonly ascribed in large part to the variations in the muscular activity and yet there has been a definite belief that the basal energy requirement for women may be materially different from that for men. In connection with observations made on a large number of normal men and women, primarily for the purpose of comparing them with pathological subjects, we have accumulated the results of observations on 89 men and 68 women, all of whom were in 'presumably good health.' The experiments were made with essentially the same technique and with the subject in the same condition of muscular repose and the post-absorptive state, i.e., 12 hours after the last meal. Under these conditions, differences due to muscular activity are entirely eliminated and we obtain the basal normal caloric output of the individuals studied.

The total heat production, computed on the 24-hour basis, was greater with the men, i.e., 1638 calories as against 1355 calories with the women. Of special interest is the fact that the oxygen consumption per kilogram per minute—a unit of measurement commonly employed by physiologists—was remarkably uniform with both sexes, being 3.65 cc. with the men and 3.58 cc. with the women. On the basis of heat-production per 24 hours, the men showed 25.5 calories per kilogram of body weight and the women 24.9 calories. On the debatable unit of apportionment of heat-production per square meter of body surface the men had 832 calories per 24 hours against 772 calories for the women.

It should be borne in mind, however, that the 89 men had an average body-weight, without clothing, of 64.3 kg. and the 68 women a body-weight of but 54.5 kg.; furthermore, the average height of the men was 172 cm. and that of the women 162 cm. A direct, unqualified comparison of the total metabolism of these two classes, or of the metabolism per kilogram of body weight or per square meter of body surface is, therefore, not permissible for it is not logical to compare two groups of individuals with unlike weight and height.

From the groups of men and women it was possible to make selections of a number of individuals who had approximately the same height and weight; on this basis alone can an intelligent comparison be made. Eleven groups, with body weights varying from 67 kg. to 45 kg., were compared and it was found that the average heat-production of all eleven groups, computed on the basis of per kilogram of body weight, was 26.5 calories with men and 25.0 calories with women. The heat output of the men was greater in all but three of the eleven groups.

Using again the computation on the basis of the heat production per square meter of body surface we found that the average for the eleven groups showed 819 calories per 24 hours for the men as compared with 770 calories for the women. Of the eleven groups only two had lower values for the men than for the women.

On the basis of the foregoing paper, giving the results of a study of athletes, we rigorously excluded athletes from these comparisons, and hence we are dealing here with non-athletic men and women of the same height and the same weight. It is thus reasonable to suppose that the actual body surface of the different groups must have been very nearly the same, and it is not logical to assume that the larger heat production noted with the men was due to a disproportion between the body measurements and the body surface. We believe that these data show a basal metabolism for men some 5 or 6% greater than for women of similar height and weight, and that this increase is due to the fact that in all probability the women, particularly in those groups with the greater body weight, had a much larger proportion of subcutaneous fat than did the men, thus indicating a consequent smaller proportion of active protoplasmic tissue.

The detailed report of this investigation has been transmitted to the *Journal of Biological Chemistry*.

THE FACTORS AFFECTING NORMAL BASAL METABOLISM

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Although it is well known that the basal normal metabolism of individuals varies considerably, the exact cause for these variations is not known. For many years physiologists have believed that the heat production of a living body is proportional to the surface area. This most helpful hypothesis served to bring order out of chaos in the earlier